

REMARKS

Reconsideration of the application in view of the following remarks is requested. Claims 31-52 are in this application. Claims 1-30 have been cancelled. Claim 42 has been amended.

On May 8, 2007, the Examiner and applicant discussed the present application. Applicant understood the Examiner to indicate that claims 31-41 were allowable, and claims 42-52 would be allowable if amended to reintroduce the limitations deleted in the last amendment. The Examiner and applicant also discussed the Summary of the Invention section, and the specification. Applicant agreed to add a Summary of the Invention section, and submit a substitute specification.

As a result, the specification has been amended via substitute specification to include a Summary of the Invention section. In addition, the specification has also been amended to correct a number of informalities. Thus, as noted above, please replace the immediate prior version of the specification of record with the present substitute specification in accordance with 37 CFR §1.121(b)(3)(i). A marked-up copy of the immediate prior version of the specification of record, which includes the abstract but not the claims, is attached in Appendix A in accordance with 37 CFR §1.121(b)(3)(ii) and 37 CFR §1.125(c). The marked-up copy, which shows the changes on pages 2, 3-5, and 6, includes pages 1-10. The present substitute specification, which is a clean version of the marked-up copy, is attached in Appendix B in accordance with 37 CFR §1.121(b)(3)(ii) and 37 CFR §1.125(c). The present substitute specification in Appendix B, which includes the abstract but not the claims, includes pages 1-10. In addition, the present substitute specification in Appendix B

includes no new matter in accordance with 37 CFR §1.121(b)(3)(ii) and 37 CFR §1.125(b).

In addition, applicant notes that a non-amended portion of the third paragraph on page 5 of applicant's originally-filed specification was incorrectly recited when the third paragraph was amended in the amendment mailed on May 20, 2005. The present substitute specification reflects the specification as originally-filed and subsequently amended, and does not include the error inadvertently introduced in the non-amended portion of the third paragraph in the May 20, 2005 amendment.

Applicant further notes that a non-amended portion of the fifth paragraph on page 5 of applicant's originally-filed specification was incorrectly recited when the fifth paragraph was amended in the amendments mailed on March 15, 2002 and May 20, 2005. The present substitute specification reflects the specification as originally-filed and subsequently amended, and does not include the error inadvertently introduced in the non-amended portion of the fifth paragraph in the March 15, 2002 and May 20, 2005 amendments.

In the present rejection, the Examiner objected to the disclosure because applicant cancelled the Summary of the Invention section. As noted above, the specification has been amended to include a Summary of the Invention section as indicated by the marked-up specification attached in Appendix A and the clean substitute specification attached in Appendix B.

In the present rejection, the Examiner rejected claims 42-47 and 49-50 under 35 U.S.C. §102(e) as being anticipated by Li et al. (U.S. Patent No. 6,162,368). As noted above, applicant understood the Examiner to indicate that claims 42-52 would be allowable if claim 42 was amended to reintroduce the limitations deleted in the last amendment. As a result, claim 42 has been amended to add the substantive limitations that were deleted in the last amendment.

With respect to the rejection, applicant notes that claim 42 recites:

"A method of planarizing a layer of semiconductor material formed on a wafer, the wafer having a top surface, the top surface having a first region and a second region that lies above the first region, the first region being equal to a lowest part of the top surface, the second region being equal to a highest part of the top surface, the method comprising:

"conformally forming a layer of first material to contact the top surface of the wafer, the layer of first material having a top surface, the top surface of the layer of first material having a first region and a second region that lies above the first region of the layer of first material, the first region of the layer of first material being equal to a lowest part of the top surface of the layer of first material, the second region of the layer of first material being equal to a highest part of the top surface of the layer of first material;

"forming a layer of second material to contact and adhere to the top surface of the layer of first material; and

"performing a chemical-mechanical polish of the layer of second material and the layer of first material, the chemical-mechanical polish continuing until the layer of second material has been substantially all removed from the layer of first material at which time the layer of first material has a substantially planar top surface, the substantially planar top surface of the layer of first material lying over the second region of the top surface of the wafer."

In rejecting the claims, the Examiner pointed to the formation of polysilicon layer 16 shown in FIG. 2A of Li as constituting the "conformally forming a layer of first material" element required by the claims, and the formation of native oxide layer 18 shown in FIG. 2A of Li as constituting the "forming a layer of second material" element. The Examiner also pointed to the chemical-mechanical polishing steps shown in FIGS. 2D-2F of Li as constituting the "performing a chemical-mechanical polish" element required by the claims.

In the amendment received by the PTO on August 24, 2006, applicant pointed out that FIG. 2C of Li expressly shows that after native oxide layer 18 has been

substantially all removed, polysilicon layer 16 has a severely non-planar top surface. As a result, a claim would be distinguishable over the Li reference if the claim recited that, at the instant the layer of second material has been substantially all removed, the layer of first material has a substantially planar top surface. This is because Li discloses just the opposite; namely, that at the instant the layer of second material (native oxide layer 18) is substantially all removed as shown in FIG. 2C of Li, the layer of first material (polysilicon layer 16) has a severely non-planar top surface.

Thus, the question is whether applicant's claim language recites this distinction (planar versus non-planar top surface the instant the layer of second material (native oxide layer 18) is substantially all removed). In the amendment received by the PTO on August 24, 2006, Applicant argued that the term "until" is an action word that indicates continuation of an action to a specified time. Thus, claim 42 requires that the chemical-mechanical polish continue to a specified time, which is the removal of substantially all of the layer of second material. At this point, the action (the chemical-mechanical polish) stops.

In addition, the phrase "at which time" refers to the layer of first material after the action (the chemical-mechanical polish) has stopped. In the amendment received by the PTO on August 24, 2006, Applicant argued that if the Li reference is read as teaching that native oxide layer 18 (read to be the layer of second material) is polished with slurry 50a until substantially all of native oxide layer 18 has been removed (at which time slurry 50b is used), then Li fails to teach or suggest that at the time (at which time) slurry 50b is used, polysilicon layer 16 has a substantially planar top surface.

The Examiner, however, does not appear to have addressed this argument (i.e., why the claim language fails to recite the distinction that at the instant the layer of second material has been substantially all removed, the layer of first material must

have a substantially planar top surface, or why the claim language encompasses subsequent processes).

As a result, the chemical-mechanical polishing taught by Li can not be read to be the chemical-mechanical polish required by the claims. Therefore, since the Li reference does not teach or suggest the chemical-mechanical polish element required by claim 42, claim 42 is not anticipated by Li. In addition, since claims 43-47 and 49-50 depend either directly or indirectly from claim 42, claims 43-47 and 49-50 are not anticipated by Li for the same reasons as claim 42.

With further respect to claim 49, this claim recites:

“forming a layer of third material over the substantially planar top surface of the layer of first material, the third layer of material lying above and being vertically spaced apart from the second region of the top surface of the wafer.”

In rejecting the claims, the Examiner pointed to FIGS. 2A-2I, and the text from column 4, line 37 to column 6, line 54 of Li as teaching the formation of a third layer of material. In the Response to Arguments section, the Examiner pointed to FIG. 2I of Li and argued that polishing pad 110 (114) can be read to be the third layer of material.

In the amendment received by the PTO on August 24, 2006, applicant noted that polishing pad 110 (114) is not formed over the polished layer of material, but instead is placed over the polished combination of insulative layer 14 and polysilicon layer 16 shown in FIG. 2I of Li. Applicant argued that one skilled in the art would not understand the placement of a polishing pad to be the formation of a layer of material. From what can be determined, the Examiner did not address this argument. Thus, since one skilled in the art would not understand the placement of

a polishing pad to be the formation of a layer of material, claim 49 is not anticipated by Li for this additional reason.

With further respect to claim 50, this claim recites "wherein the layer of third material is a mask." In the Response to Arguments Section of the May 31, 2006 office action, the Examiner argued that the term "mask" does not have any special meaning because applicant did not define what the mask layer entails or represents in terms of its function and usage. Applicant, however, is not arguing that the term "mask" be given any special meaning, but that the term "mask" be given its usual and customary meaning in the semiconductor art.

The Examiner further argued that the term "mask" has a very broad interpretation and function in the semiconductor industry, and that a polishing pad is analogous to a mask for a CMP process. The Examiner then requested that applicant supply evidence that the function of a mask is different from the function of a polishing pad.

In the amendment received by the PTO on August 24, 2006, applicant provided the definition of a mask, and noted that since a polishing pad does not shield part of a semiconductor during an etching or deposition process, a polishing pad can not be interpreted to be a mask.

In the present office action, the Examiner does not appear to have addressed this argument. The Examiner pointed to no contrary evidence as to the meaning of the term "mask," but merely asserted that based on the plain interpretation of the term "mask," it is proper to consider a pad a mask. Applicant respectfully does not understand the Examiner's reasoning, which is because "the invention CMP process and pad layer used as mask during CMP process in the art."

Therefore, since a polishing pad can not be read to be a mask, claim 50 is not anticipated by Li for this reason as well.

The Examiner also rejected claim 48 under 35 USC §103(a) as being unpatentable over Li et al. in view of Weling et al. (U.S. Patent No. 5,378,318). In rejecting the claims, the Examiner argued that Li teaches all of the claimed limitations except for a specific etch selectivity. However, as noted above, the Li et al. reference does not teach all of the claimed limitations. As a result, claim 48 is patentable over the Li et al. reference in view of the Weling et al. reference for the same reasons that claim 42 is not anticipated by the Li et al. reference.

The Examiner further rejected claims 51-52 under 35 USC §103(a) as being unpatentable over Li et al. in view of Sandhu et al. (U.S. Patent No. 5,381,302). In rejecting the claims, the Examiner noted that Li does not specifically disclose that the layer of third material lowers a resistance of polysilicon, but pointed to Sandhu as teaching the formation of a metallic layer 62 over a polysilicon layer 65 to lower the sheet resistance of the polysilicon layer. The Examiner then argued that one skilled in the art would have been motivated to form a metal layer over the polysilicon layer to reduce the sheet resistance of the polysilicon layer.

In the amendment received by the PTO on August 24, 2006, applicant noted that the Examiner has not read a polysilicon layer to be the third layer of material, but instead has read polishing pad 110 (114) to be the third layer of material. Applicant further noted that there is nothing in Sandhu that teaches or suggests that polishing pad 110 (114) lowers a resistance of doped polysilicon.

From what can be determined, the Examiner did not address this argument. Although it may be obvious to form a metallic layer on a layer of polysilicon to reduce the resistance, one skilled in the art would not be motivated to form a metallic layer on the planarized layer of polysilicon 16 shown in FIG. 2D of Li because Li teaches that the top surface of polysilicon layer 16 is to be further planarized as shown in FIG. 2E of Li.

Thus, since Sandhu does not teach or suggest that a polishing pad lowers the resistance of polysilicon, claim 51 is patentable over Li in view of Sandhu. In addition, since claim 52 depends directly from claim 51, claim 52 is patentable over Li in view of Sandhu for the same reasons that claim 51 is patentable over Li in view of Sandhu.

With further respect to claim 52, this claim recites "forming a mask on the layer of third material." In rejecting the claims, the Examiner pointed to Sandhu as teaching the formation of a mask over the metal layer (titanium) to keep the titanium over the polysilicon plug, while removing the titanium from the portion of the ILD layer.

In the amendment received by the PTO on August 24, 2006, applicant noted that the Examiner has read polishing pad 110 (114) to be the third layer of material. Applicant has been unable to find anything in Sandhu that teaches or suggests forming a mask on polishing pad 110 (114). From what can be determined, the Examiner did not address this argument. Thus, claim 52 is patentable over Li in view of Sandhu for this additional reason.



Thus, for the foregoing reasons, it is submitted that all of the claims are in a condition for allowance. Therefore, the Examiner's early re-examination and reconsideration are requested.

Respectfully submitted,

Dated: 8-15-07 By: Mark C. Pickering  
Mark C. Pickering  
Registration No. 36,239  
Attorney for Assignee

P.O. Box 300  
Petaluma, CA 94953-0300  
Telephone: (707) 762-5500  
Facsimile: (707) 762-5504  
Customer No. 33402